

IN THE CLAIMS:

Claim 1 (currently amended): A Code Division Multiple Access [[CDMA]] (CDMA) communication system, ~~wherein~~ comprising:

a transmitter ~~comprises~~ comprising:

means for preparing binary Zero Cross Correlation Zone [[ZCCZ]] (ZCCZ) spreading sequences belonging to a Zero Correlation Zone (ZCZ) spreading sequence family of sequence groups in which no periodic cross correlation function between an arbitrary pair of the spreading sequences exists for a correlation function region near 0 shift, as mutually different spreading sequences for identifying users,

means for producing an expanded symbol frame which is made by adding guard sequences to both sides of the ZCCZ spreading sequence that is the central frame, and

means for producing a transmission base band symbol frame by multiplying the expanded symbol frame by a transmission information, and

a receiver ~~comprises~~ comprising:

means for receiving the ~~received~~ base band symbol frame corresponding to the transmitted base band symbol frame, and

means for demodulating the received frame in correlation with the ZCCZ spreading sequence used by the transmitter of a desired station or a local sequence for demodulation as reference sequence, and means for further making ~~hard decision making~~ of the demodulated output on the hard decision.

Claim 2 (currently amended): The CDMA communication system of claim 1, wherein:

each user transmitter belonging to a communication system comprises means for transmitting an isolated pilot frame, and

a base station receiver ~~comprises~~ comprising:

means for producing respective cross correlation function responses of the isolated pilot frames incoming from the user transmitters with an arbitrary spreading sequence or an auto-orthogonal sequence and for accumulating pilot response sequences, and

means for producing a demodulated output by analyzing the received base band frame with the cross correlation function response set.

Claim 3 (currently amended): A Code Division Multiple Access [[CDMA]] (CDMA)

communication system ~~comprising, in order to produce~~ utilizing a Zero Cross Correlation Zone spreading sequence (ZCCZ) wherein the means for producing the ZCCZ spreading sequence comprises: ~~used in the first aspect,~~

a means for preparing one sequence of k-th ($k=1, 2, \dots, K$) sequence length N_1 belonging to a Zero Correlation Zone (ZCZ) [[ZCZ]] sequence family of which periodic auto-correlation function has no auto-correlation region at both sides of the 0 shift, and of which periodic cross-correlation function between an arbitrary pair of sequences has no correlation region at both sides of the 0 shift, including the 0 shift, and

a means for preparing a block sequence d with sequence length N_2 that is prime to N_1 , which belongs to a p-th ($p=1, 2, \dots, P$) semi-orthogonal sequence family of which Hamming distance between an arbitrary pair of the sequences takes a relatively large value,

[[and]] a means for producing a repetitive ZCZ sequence and a repetitive block sequence by repeating both sequences so as to take a product sequence length N that is N_1 times N_2 , and

a means for producing in advance a product sequence with sequence length N by multiplying both the repetitive sequences on the respective corresponding chip positions, in which the product sequence is used as the ZCCZ spreading sequence.

Claim 4 (currently amended): The CDMA communication system of claim 3, wherein the product sequence S_{kp}^j is assigned to a system in a method comprising the steps of:

making the block sequence d hierarchical with a sub-block matrix H_p^* ($p = 1, 2, \dots, P$),

producing a family of product sequence S_{kp}^j made of the j -th ($j = 1, 2, \dots, J$) block sequence d_{pj} belonging to H_p^* and the k -th ($k = 1, 2, \dots, K$) ZCZ sequence C_k belonging to the ZCZ sequence family, and

providing the stratified family elements k , p , and j with the system elements of cell number, user number, and transmission information level in an arbitrary order.

Claim 5 (currently amended): The CDMA communication system of claim 4, wherein the product sequence S_{kp}^j is assigned to the system in a method comprised of providing a combined family composed of at least one to three elements of stratified family elements k , p , j with one system element, and a combined family composed of the remaining stratified family elements with

other system elements.

Claim 6 (currently amended): The CDMA communication system of claim 4 or 5, wherein the Zero Cross Correlation Zone (ZCCZ) ~~ZCZ-sequence~~ sequences corresponding to the stratified family element elements assigned to the cell number of system elements ~~[[is]]~~ are used as a scramble code for transmission and as a descramble code for reception.